

tion of the International Geodetic Association, and, owing to its immediate interest, has absorbed the greater portion of its funds. The astronomical world was surprised by the announcement of Prof. Chandler that he was able to demonstrate from existing observations that the earth's pole describes a closed curve taking about fourteen months to complete a revolution. The possibility of a periodic shift of the earth's axis was foreseen by Euler, who calculated the time of revolution to be ten months; but observations did not show a sensible period of that duration. No one apparently before Chandler tried to see whether another period beyond a small annual one existed. The discrepancy between the calculated ten and the observed fourteen months was cleared up by Prof. Newcomb, who pointed out that Euler's calculation was based on the supposition that the earth is an absolutely rigid body. Any yielding would increase the length of the period; in fact, the earth must be more rigid than steel in order that the period should be as short as fourteen months. This shows how indirect information on the physical properties of the earth may be obtained sometimes in an unexpected manner, the periodic revolution of the pole leading to an estimate of the average rigidity of the interior of the earth. The total displacement of the pole of the earth from its average position is small, never amounting to more than 8 metres. The accuracy with which that displacement can be measured is a testimony to the excellence of our astronomical observations. It is a type of work in which cooperation is absolutely necessary. The subject has received additional interest through the suggestion made by Prof. Milne in his recent Bakerian lecture that seismic disturbances may be caused by the changes in the position of the earth's axis. Considering that the distortions in the earth are sufficient to increase the periodic revolution of the pole from ten to fourteen months, this suggestion is well worth investigation, and the 300*l.* per annum spent by this country in support of the work of the Geodetic Association will be well employed if it allows the vagaries of our pole to be more closely studied and all the dimensional quantities of the surface of the earth to become more accurately known.

The contributions received by the Central Bureau of this association from the participating States amount to about 3000*l.*, and there is a balance which at the end of 1904 amounted to more than 5000*l.* The expenditure during 1905 was nearly 5000*l.*, reducing the balance by 2000*l.* The principal items of the expenditure were formed by contributions towards the maintenance of six stations in the northern and two stations in the southern hemisphere for carrying out the observations relating to the changes of the position of the earth's axis. The whole cost of this service is about 4450*l.* The honorarium of the secretary is 250*l.*, which, together with the cost of printing, postage, and a small item for grants toward special scientific work, makes up the expenditure. No charges are made for office expenses, which are defrayed by the Prussian Government.

The geodetic work indirectly gives us valuable, though only partial, information on the interior of the earth, but it confines itself in the main to the surface of the globe; the investigation of our atmosphere carries us beyond.

(To be continued.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. J. P. HILL has been appointed to the Jodrell chair of zoology at University College, London.

At King's College, London, Dr. C. S. Myers has been appointed professor of psychology (including experimental psychology), and Mr. H. S. Allen senior lecturer in physics.

THE Rev. T. C. Fitzpatrick, dean and supernumerary fellow of Christ's College, has been elected president of Queens' College, Cambridge, in succession to the Bishop of Ely.

A COURSE of five free public lectures is to be given, in accordance with the will of Mr. Brown, in the physiological laboratory of the University of London on July 9, 11, 13, 16, and 18, by Prof. T. G. Brodie, F.R.S., on the

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"Secretion of Urine under Normal and under Pathological Conditions."

THE trustees of the Brooklyn Polytechnic Institute have, we learn from *Science*, subscribed 160,000*l.* toward the 400,000*l.* necessary to endow the proposed extension of the institute, affording facilities for more advanced work. In addition to this handsome provision for higher education, our contemporary announces that Mr. and Mrs. Jacob Turtellout, of Minneapolis, have offered to give 80,000*l.* to build and endow an academy for the town of Thompson, Conn., and that Dr. Henry M. Saunders, of New York, a trustee of Vassar College, has given 15,000*l.* for the erection of a building as a memorial to his wife.

THE current number of *Macmillan's Magazine* contains an article by Mr. A. C. Passmore on technical education, in which some of the weaknesses of systems of instruction of this type are summarised. The need is insisted upon for adequate preliminary training of a suitable kind for students beginning courses of technology. It is urged that instead of being in such a hurry to provide technical schools it would be worth while to consider the qualifications and fitness of the teachers. The examination system is cited as one of the chief causes conspiring to make British technical education unsatisfactory. But the author appears to be unacquainted with the work being done in many of the great municipal technical schools, and to have ceased his educational observations some ten or fifteen years ago. Conditions at present are better than Mr. Passmore paints them.

AMONG the bequests made by Mr. F. W. Webb, who died on June 4, we notice the following:—2000*l.* to Owens College, Manchester, to establish for the benefit of employees and sons of employees of the London and North-Western Railway a "Webb" scholarship tenable at Owens College, Manchester; 2000*l.* to the University College of Liverpool for a similar purpose there as defined for Owens College, Manchester; 1000*l.* to the Institute of Civil Engineers for providing annually a "Webb Medal," and a premium of books to be awarded for the best paper on railway machinery.

THE annual assembly and prize distribution at University College, London, on Tuesday, July 3, was of more than usual interest from the fact that the friends of Prof. Carey Foster had taken the opportunity of then presenting to the college the portrait of Prof. Foster which has been painted by Mr. Augustus John. The presentation was made by Prof. F. T. Trouton, who recalled the fact that Prof. Foster was the first to introduce practical laboratory teaching in physics into England. Many of the methods devised by him in the development of his laboratory courses are to-day recognised as standard ones. For instance, every student has to go through and know his Carey-Foster Bridge as surely and regularly as at school he has to pass the fifth proposition of the first book of Euclid. The example set by Foster was followed in laboratory after laboratory, until to-day there is not a town without its course of experimental physics. Prof. Trouton concluded by hoping that though the portrait represented its subject as an older man than he really is, yet his useful life might be spared until the portrait may become that of a much younger man. The Right Hon. Lord Reay, G.C.S.I., who received the portrait on behalf of the college, referred to the great impetus which the study of physics had received by his work and writings, which are characterised by great clearness and lucidity. More especially he referred to the debt owed to Prof. Foster by the college, of which he became the first principal at a time at which great tact and knowledge were required in connection with the delicate negotiations leading to the incorporation of the college in the University of London. His lordship concluded by presenting a replica of the portrait to Mrs. Carey Foster. Prof. Foster, in acknowledging the presentations, alluded to the interval of fifty-three years since he was first present at a ceremony of the same kind. In one respect the present ceremony was of historical interest, inasmuch as it was the last ceremony to be held by the college before its incorporation. He looked forward to the advantages arising from this incorporation. The prominent defect in the higher teaching in London is the dispersion of the large

resources amongst various organisations which are in some respects rivals. Principal Rücker had recently said that "any organisation to be visible must be on a grand scale." It is only by combination that the colleges of London can hope to attract the support which is so urgently needed.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 8.—"The Microscopic Changes in the Nervous System in a Case of Chronic Dourine or Mal de Coit, and Comparison of the Same with Those found in Sleeping Sickness." By Dr. F. W. Mott, F.R.S. (From the Pathological Laboratory of the London County Asylums.)

The author describes the changes in the central nervous system of an Arab stallion, which acquired the disease by infective coitus. After exhibiting 156 characteristic cutaneous plaques, together with marked symptoms of paraplegia, it died 27½ months after infection. The material was forwarded by Dr. Lingard, director of the Imperial Bacteriological Laboratory of India, who has written an interesting monograph on dourine. A full description of the etiology and clinical symptoms of this disease is contained in this monograph, and an account in detail of this particular case.

Dourine is due to a specific form of trypanosome, affects equines, and is transmitted, like syphilis, by coitus. This is of especial interest, since the *Spirochaeta pallida* has been shown to be the infecting agent in syphilis.

A comparative examination of the tissues of the central nervous system in this disease and in sleeping sickness, experimental and human, appears to show that prolonged trypanosome infection results in a chronic lymphadenitis, followed later by a chronic interstitial inflammation of the lymphatic structures of the nervous system. The morbid process in the case of dourine starts in one seat of primary infection, extends to the inguinal glands, and thence (presumably by the pelvic lymphatics) spreads by the lumbosacral nerves to the posterior spinal ganglia, where it may set up an intense inflammatory process with destructive atrophy of the cells. This destruction of the trophic sensory centres which was found in this case of dourine would account for the cutaneous eruption which occurred during life. It would account also for the marked degeneration of the posterior roots and the sclerosis in the posterior columns, especially in the root zones. The lesion in some respects therefore resembled locomotor ataxy, and it is of interest to note that cases of dourine have occurred in which fractures and dislocations have been observed—due probably to neurotrophic changes. Moreover, there were other signs of chronic irritation observed elsewhere in the spinal cord and nervous system, viz. subpial and septal proliferation of the glia tissue. Marck has described the disease as an infective polyneuritis; there were reasons, however, in this case, for supposing that the motor nerves were not affected by a degenerative change in the same way as the posterior roots.

March 22.—"A Note on the Theory of Directive Antennæ or Unsymmetrical Hertzian Oscillators." By Prof. J. A. Fleming, F.R.S.

This paper deals with the theory of bent or unsymmetrical Hertzian oscillators. As is well known, a straight linear oscillator radiates equally in all directions around the axis. It has been found, however, by Mr. Marconi that if an antenna for electric-wave telegraphy is bent so that a short part of its length, rising from the earth, is vertical, and the greater part horizontal, and therefore parallel to the earth, such an oscillator radiates less in the direction in which the free end points than in the opposite direction.¹ This is of great practical importance, and the writer accordingly investigated mathematically the behaviour of a simple case of an unsym-

metrical oscillator consisting of three simple oscillators of equal electric moment ϕ superimposed so as to make a doubly bent oscillator of the shape

If V denotes the scalar potential at a point in the field at a distance r large compared with the dimensions of the oscillator, and F , G , and H the components of vector potential, then it is shown in the paper that

$$V = -\frac{\phi}{k} \frac{d\Pi}{dz} + \frac{1}{2} \frac{\phi}{k} \frac{d^2\Pi}{dydz} \delta y - \frac{\phi}{k} \frac{d^2\Pi}{dzdy} \delta z,$$

$$F = 0, G = \phi \frac{d^2\Pi}{dzdt} \delta z, H = \phi \frac{d\Pi}{dt} - \frac{1}{2} \phi \frac{d^2\Pi}{dydt} \delta y,$$

where $\Pi = \sin(mr - nt)/r$, and from these expressions the electric (E) and magnetic (H) force at various points in the field can be obtained. The final result is to give expressions for these forces normal to the radius vector drawn in the equatorial plane of symmetry as follows:—

$$H = \frac{1}{r^3} \left[\left(\phi v m^2 r^2 \right)^2 + \left(\phi v m r - \frac{M}{z} m^2 r^2 \cos \theta \right)^2 \right]^{\frac{1}{2}},$$

$$E = \frac{1}{k r^3} \left[\left(\phi (m^2 r^2 - 1) + \frac{3}{2} \frac{M \cos \theta}{v m r} \right)^2 + \left(\phi m r - \frac{M}{2v} (m^2 r^2 + 3) \cos \theta \right)^2 \right]^{\frac{1}{2}},$$

where $\cos \theta$ is the azimuthal angle the radius vector makes with the axis of the oscillator reckoned from the direction in which the free ends point. These expressions show that as θ increases from 0° to 180° the values of E and H vary, and are greater when $\theta = 180^\circ$ than when $\theta = 0^\circ$.

Hence there is an unsymmetrical radiation by such an oscillator, greatest in the direction opposite to that in which the free ends point.

Such an oscillator may also be regarded as the combination of a completely closed conductive circuit or magnetic oscillator with a straight or open electric oscillator. The field of the magnetic oscillator was investigated by the late Prof. G. F. Fitzgerald (see his scientific writings, edited by Prof. J. Larmor, Sec.R.S., p. 128) prior to the date of Hertz's discoveries, and in the discussion at the Royal Society on March 22 on Mr. Marconi's paper, *loc. cit.*, it was pointed out by Prof. J. Larmor that a bent oscillator of the kind above discussed was equivalent in electromagnetic action to a magnetic plus an electric oscillator.

May 3.—"On a Static Method of Comparing the Densities of Gases." By R. Threlfall, F.R.S.

Since it is a simple matter to make a manometer showing differences of gas pressure of a few centimetres of water, accurate to between 1/100 mm. and 1/1000 mm., according to the construction, it is possible to determine the relative densities of gases by a method similar to the one employed by Regnault in determining the temperature-density variation of mercury.

It is shown that, using gas columns 20 metres long, the difference of density of "chemical" and "atmospheric" nitrogen should be capable of observation. The author has employed the method in a comparison of the densities of producer gas and air, using gas columns about 20 metres in height. The two columns of gas and air respectively were contained in composition pipes twisted together and immersed in water in an outer iron pipe through which a stream of water passed.

In two experiments on two different samples of gas differences of pressure of 0.3458 cm. and 0.3550 cm. of water respectively were observed, and producer-gas densities accurate to about 1/5000th part in terms of the density of air were deduced. The commercial micromanometer made by the Cambridge Scientific Instrument Co. to the author's designs was employed in these comparisons, and, since it is possible to construct an instrument say five times as sensitive, and to use columns of gas at least twice as long without inconvenience, the method should yield values of relative density correct to 1 part in 10,000 without difficulty.

¹ See Proc. Roy. Soc., vol. lxxvii. p. 413, 1906. G. Marconi, "On Methods whereby the Radiation of Electric Waves may be mainly confined to certain Directions, and whereby the Receptivity of a Receiver may be restricted to Electric Waves emanating from certain Directions."